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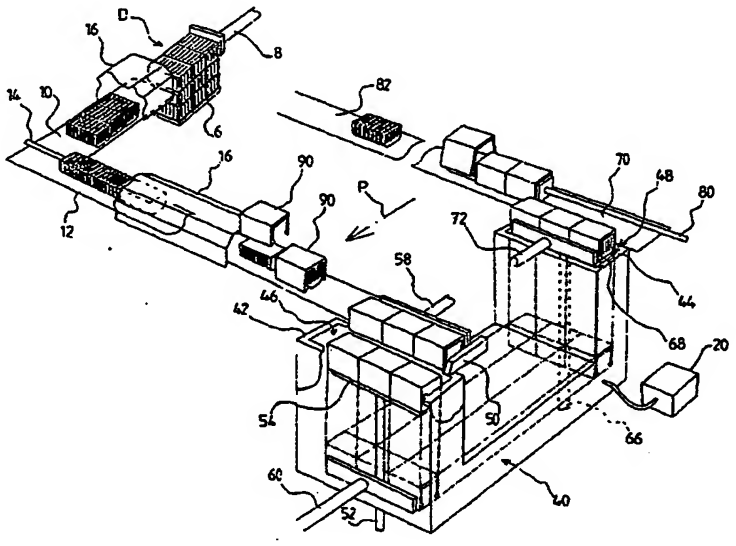
(54) Title: THE TREATMENT OF SMALL ANIMALS



(57) Abstract

Poultry is stunned by a subjection to a treatment gas having an anaesthetic and/or noxious effect. A chamber (40, 106, 140, 170, 200, 218) is utilised, to which the treatment gas is delivered, and the treatement environment is maintained. Crates (18, 48, 72, 114) are delivered by a conveyor mechanism (22, 50, 78, 108) to the vicinity of an inlet (8, 42, 80, 102a, 102b, 102c), and mechanism is utilised which conveys the containers through the inlet and into the chamber and preferably through the chamber to an outlet (10, 144, 184, 102a, 102b, 102c), from which the crates are conveyed by further mechanism. The speed at which the containers are conveyed through the treatment gas in the chamber is such that humane stunning or killing of the poultry is effected during passage thereof from the inlet to the outlet.

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Title: The Treatment of Small Animals

Description of Invention

This invention is concerned with improvements relating to the treatment of small animals, and particularly concerns a treatment plant for the humane stunning or killing of small animals, particularly but not exclusive poultry.

Conventionally poultry is stunned prior to killing by electrical means, and whilst this is quick, it suffers from a number of disadvantages.

There is described in EP-A-434278 a method and apparatus for the slaughter of poultry involving the use of anaesthetising effect of carbon dioxide, to which specification reference should be made for further information. However difficulty has been encountered in providing a plant for putting this practice into effect, particularly in relation to a high volume throughput.

It is one of the various objects of this invention to provide a means for the humane stunning or killing of small animals, particularly but not exclusively poultry. The invention will be described hereinafter in relation to its use with poultry, but it is to be understood that other small animals may be substituted for poultry.

According to this invention there is provided a treatment plant comprising a chamber, means for maintaining a controlled environment within the chamber, an inlet through which a container may be moved, means to move the container through the inlet into the chamber, a means for moving the container through the chamber, and means to move the container from the chamber.

The present invention may be put into practice by one or more of the following techniques:

1) using a gas having an anoxic or anaesthetising effect (hereinafter referred to as being the treatment gas) which is denser than air. Such gases may include argon, krypton, xenon, and carbon dioxide;

2) using a treatment gas which is less dense than air, such as helium, neon or nitrogen;

3) utilising as treatment gas a gas from which oxygen has been removed, such as by the use of burning, and/or using an oxygen absorbent substance;

4) using in the treatment gas a non-toxic anaesthetic gas.

The same mechanism may be used both to move the container through the inlet into the chamber, and to move the container through the chamber. Similarly the same mechanism may be utilised both to move the container through the chamber and to move the container from the chamber.

For example a carousel mechanism may be utilised, operating on a continuous basis, onto which containers are placed, and by which containers are moved through the inlet into the chamber, through the chamber and through an outlet from the chamber.

Alternatively separate mechanisms may be utilised to move a container through the inlet into the chamber, and to move the container through the chamber. A further separate mechanism may be utilised to move the container through the outlet from the chamber.

However, feasibly the inlet and the outlet are provided at the same location in respect of the chamber.

Preferably the treatment plant comprises delivery mechanism to deliver containers, preferably serially, whether serially individually or serially in groups, to the vicinity of the inlet, and to convey containers from the vicinity of the outlet.

Preferably the plant comprises means to convey the containers from the inlet into the treatment chamber in a heightwise direction, and from the chamber to the outlet in a heightwise direction.

Thus where the treatment plant comprises means for maintaining a controlled atmosphere in the chamber comprising a gas or a mixture of gases having a density less than that of air, preferably said means is operative to convey the containers from the inlet upwardly into the controlled environment.

Alternatively, where the density is greater than that of air, preferably said means is operative to convey the containers from the inlet downwardly into the controlled environment.

For example an inlet shaft may extend downwardly from the inlet opening to the chamber and an outlet shaft may extend upwardly from the chamber to the outlet opening, the chamber and said shafts being sealed against the escape of treatment gases below the inlet and outlet openings.

Such a plant is particularly suitable for use where the treatment with which the chamber is concerned involves use of heavier than air gases such as carbon dioxide, for example when in admixture of an inert gas such as argon. In this manner loss of gas as may be caused by entry of the containers into the chamber or exit therefrom may be minimised, particularly by selection of appropriate lower/raising rates. Preferably the containers with which the plant is used, together with the conveying means, such that in horizontal cross-section, the containers entering the treatment plant occupy only a proportion of the cross-section of the inlet and outlet shafts, e.g. no more than 75%, preferably 65% or less, to prevent gases being removed from the chamber unduly by the piston-like effect of containers as they move within the inlet and outlet shafts. Preferably similarly the containers are such that, in vertical cross-section, they occupy only a proportion of the cross-section of the treatment chamber, similarly no more than 75%, preferably 65% or less to prevent gases removed from the chamber unduly by the piston like effect of containers as they move through the chamber.

The inlet and outlet openings may be sideways open, but are preferably upwardly open. Preferably the plant comprises loading mechanism for moving a container from a loading station adjacent to the inlet opening to a position in which said container may be engaged with first vertically movable means (e.g. lowering means) and preferably the plant comprises unloading mechanism for moving a container from engagement with the second vertically movable means (e.g. lifting means) to an unloading station adjacent to the outlet opening.

The lifting and lowering means, together with the loading and unloading mechanisms, may each be adapted to move a single container at a time, but preferably are adapted to move more than one container at a time, such as two or three.

According to this invention there is provided a treatment plant comprising a chamber, means for maintaining within the chamber a controlled environment comprising a gas or mixture of gases having an anoxic or anaesthetising effect (hereinafter referred to as a treatment gas) on poultry, and having a density different to that of air, means for maintaining an interface between said treatment gas and air, means for conveying poultry through the interface into the treatment gas, and means to convey the poultry from the treatment gas subsequent to the treatment gas having had the desired effect.

Conveniently subsequent to the step of conveying the poultry through the interface into the treatment gas and prior to the conveying of the poultry from the treatment gas, the intermediate step is carried out of conveying the poultry through the treatment gas, whereby the poultry is retained in the treatment gas for a desired period of time.

Where the treatment gas comprises a mixture of predominantly an inert gas such as argon and carbon dioxide having a density greater than that of air, the treatment plant may comprise a well within which the treatment gas is maintained by virtue of its high density, the poultry being conveyed into the well for the treatment gas to have the required effect on the poultry, prior to lifting of the poultry from the well for further processing.

Alternatively where the treatment gas comprises light but inert gas such as helium or neon, the treatment plant may comprise an upper chamber in which the treatment gas is maintained by virtue of its lower density, the conveyor means being operative to convey the poultry upwardly through the interface and into the treatment gas, and subsequently downwardly from the treatment gas through the interface.

Alternatively or in addition, the treatment gas may comprise a gas or mixture of gases from which oxygen has been removed, such as by burning an appropriate material to remove the oxygen, such as methane, and/or by the use of oxyphilic substances to absorb the oxygen, or residual oxygen.

Preferably the poultry is conveyed through the chamber in containers, the containers conveniently holding a plurality of poults, the containers being conveyed through the chamber serially or in batches.

Preferably the plant is adapted for use in the handling of containers generally in the form described in the specification of our European Patent EP-B-0061869. Thus, advantageously the plant comprises means for the automatic removal of such containers from the module or framework, and for conveying the containers serially or in groups to the loading station.

Advantageously such conveyor mechanism is tunnelled to shield the poultry thereby to reduce stress otherwise encountered by their subjection to light and movement.

Preferably however in addition means is provided for applying a cover to the containers prior to entry thereof into the treatment chamber, whereby the containers pass through the treatment chamber with a cover, together with means for removal of the cover subsequent to the emergence of the container from the treatment plant.

Preferably the covers are open-bottomed and may be deformed over the container, being moved downwardly over the open top thereof, snap-fit means being provided to ensure that the cover is contained on the container during its travel through the treatment plant.

Preferably however the covers are open at one end, facilitating the location of the cover over the container by lateral relative movement therebetween.

Thus means may be provided to align the cover with the tunnel so that the container enters the cover on movement from the tunnel towards the treatment plant. In this way stress to the poultry may be further reduced.

Preferably the construction and arrangement is such that, as a container is pushed from the tunnel, it passes into the cover and engages the end wall of the cover and further conveying movement causes the container and the cover to pass to the loading station.

Preferably disengagement means is provided downstream of the treatment plant, to separate the cover and the container, conveniently by relative movement therebetween opposite to that by which the cover was applied to the container.

Preferably transfer means is provided to return such separated covers to a location at which they may be reapplied to incoming containers.

Each cover may be suitable in size for an application to a single container, or may be suitable for application to a plurality of containers, conveniently that number which is fed simultaneously through an inlet opening at the loading station.

Preferably prior to the cover-applying station an observation station is provided, enabling visual inspection of the poultry in the containers prior to their entry into the treatment chamber.

According to this invention there is also provided a method of the humane killing of poultry, involving subjection of the poultry to a gas having a high carbon dioxide content, wherein the poultry is conveyed to the plant in containers having open tops, and wherein a temporary cover is provided to the containers prior to movement of the containers into a treatment chamber for subjection of the poultry to the treatment gas.

Preferably the containers are moulded from plastics material, being open-topped and having side and bottom walls provided with apertures to allow for the free flow of air therethrough, the cover comprising a top and at least two side walls to be engaged with the side walls of the container.

Preferably means is provided to prevent the inadvertent removal of the cover from the container during its passage through the treatment plant, such as

by interlocking formations engageable by relative movement between the cover and the container in one direction.

Preferably such interlocking means may be snap-fitting in one direction of relative movement therebetween.

The cover may be moulded of plastics material and may be applied to the container by relative movement therebetween the heightwise direction of the container, i.e. over the open top thereof, conveniently the side walls of the cover springing apart a short distance on passage over the side walls of the container, and moving together on completion of the location of the cover over the container.

Alternatively the construction and arrangement may be such that the container may be entered into the cover by relative longitudinal movement therebetween, such as by a location of the cover in a path of travel of the container, so that the container enters the cover during its travel towards the treatment plant. Thus preferably the cover has at least one open end wall, but preferably one end thereof is closed.

The cover may be provided with small apertures to allow for the permeation of gas into the container, during treatment of the poultry, whilst preventing undue turbulence of the gases within the treatment plant caused by wing flapping of the poultry in the container.

Preferably the apertures are of sufficiently small size additionally to prevent the emergence of detritus from the container into the treatment plant during passage thereof through the treatment plant, such as small feathers.

According to this invention there is also provided a treatment plant comprising a chamber, means for maintaining a controlled environment within the chamber including maintaining within the chamber a gas or mixture of gases predominantly devoid of oxygen, and maintaining the poultry within the treatment chamber for a sufficient period of time for the poultry to be stunned or killed.

Advantageously in addition to being devoid of oxygen, the treatment gas comprises one or more anaesthetising gases, such as carbon dioxide.

The invention set out in the last preceding paragraph but one may be utilised as part of a continuous process, by which the poultry is conveyed into the chamber, e.g. through an inlet chamber and from the treatment chamber through an outlet chamber by which escape of treatment gas from the treatment chamber may be reduced, means being provided to supply treatment gas to the treatment chamber to maintain the desired environment within the treatment chamber.

For example such means may be in the form of an inlet located adjacent to the outlet chamber, by which fresh treatment gas is fed into the treatment chamber, to flow outwardly through the inlet chamber in a purging operation.

Alternatively the invention may be utilised in a batch process, in which small animals (such as in crates) is loaded into a treatment chamber, and subsequent to completion of loading the chamber is closed, and purged with treatment gas.

In such circumstances the treatment gas may be heavier than atmosphere, the chamber thus conveniently being purged from the bottom, or the treatment gas may be lighter than atmosphere, the treatment plant being enclosed at the top and being purged from the top.

The invention set out in the last preceding paragraph but one is conveniently utilised during a transportation operation involving the transportation of the poultry from (e.g.) a farm area to a processing plant, and in accordance with a further aspect of this invention there is provided a method of transportation of poultry, involving the use of a treatment plant of the kind set out in the last preceding paragraph but one, and utilising said treatment plant to humanely stun or kill the poultry during such transportation.

There will now be given a detailed description, to be read with reference to the accompanying drawings, of a treatment plant which is a preferred embodiment of this invention, having been selected for the purposes of illustrating the invention by way of example, and a method of treating poultry, which is also

illustrative of certain aspects of this invention. There is also described five alternative embodiments by which the invention may be put into practice.

In the accompanying drawings:

FIGURE 1 is an exploded perspective view showing the plant which is the preferred embodiment of this invention;

FIGURES 2, 3 and 4 are views showing the application of a cover to a container, in the performance of the preferred method of killing poultry;

FIGURE 5 is a schematic sectional view of a treatment chamber of the plant; and

FIGURES 6 - 10 are respective schematic views of five alternative embodiments.

The treatment plant which is the preferred embodiment of this invention is specifically for use in the killing of poultry, involving the subjection of the poultry to an anaesthetic and noxious gas mix, as may be afforded by a mixture of carbon dioxide and an inert carrier gas such as argon, having a low oxygen content.

The plant comprises a delivery station D, comprising a vertically movable platform 6 onto which conveniently a plurality of containers C, typically containing 24 chickens each, may be deposited, a ram 8 being operable to transfer the containers in groups of three from the stack onto a first stretch 10 of passive conveyor. Advantageously the ram 8 operates in steps, such that in each step one container at a time is pushed onto a second stretch 12 of passive conveyor, along which the container is moved by a second ram 14. On completion of delivery of the first tier of containers, the ram retracts, and the platform 6 is elevated to present the second tier of containers of the stretch 10 of conveyor.

Preferably the first and second stretches 10 and 12 of conveyor are enclosed by tunnelling 16, to reduce unnecessary stress to the poultry within the containers by shielding them from light and movement, conveniently a piston of the ram 14 extending through an end wall of the tunnel.

At a convenient location an inspection window may be provided, to enable the chickens within each container to be visually inspected, means conveniently being provided for the removal of any chicken which should need to be removed from a container.

The treatment plant comprises a chamber within which the chickens are subject to a treatment gas, from which two vertical shafts 42, 44 extend. Each of the vertical shafts if open at the top, the opening 46 of the shaft 42 providing an inlet opening, whilst the opening 48 of the shaft 44 provides an outlet opening.

Means 20 is provided (shown schematically in Figures 1 and 5) connected to the chamber for maintaining a controlled atmosphere within the chamber 40, the treatment gases being heavier than air remaining within the chamber 40, and up to about half way within the vertical shafts 44, 46.

In general the treatment chamber 40 is sealed against the escape of gas, other than at the openings 46 and 48, although an access door may be provided to enable entrance into the tank 40 for cleaning an maintenance purposes.

Adjacent to the inlet opening 46 is a loading station afforded by a fixed platform 50, onto which containers are pushed in groups of three, although of course the containers may be loaded onto the platform singly, or in groups of two, or more than three. Movable within the shaft 42 is a lowering mechanism 52, movable between a position in which it is level with the loading platform 50, and a lower position in which it is level with a passive conveyor 41 extending through the chamber. With a table 54 of the lowering mechanism at the inlet opening alongside the loading platform 50, a loading ram 58 is advanced to push three containers at a time onto the platform 54, whereupon the ram 52 retracts to lower the containers down the shaft 42 to their lowermost positions, at which an advancement ram 60 pushes said three containers one stage in the forward direction towards the shaft 44, whereupon the ram 60 retracts.

The lowering mechanism, operates again, to lower the next series of three containers into the treatment chamber 40.

The treatment plant comprises a lifting mechanism 66, comprising a platform 68 which is movable within the shaft 44 to a position adjacent to an unloading platform 70, an unloading mechanism 72 being provided to push three containers from the platform 68 when in its upper position onto the platform 70.

As each group of container is advanced within the horizontal stretch 41 of the treatment chamber 40, it pushes the groups of containers in advance thereof forwardly, and the endmost group of containers (that is those closest to the shaft 44) are pushed onto the platform 68, for elevation through the outlet opening 48 to the unloading station 70.

Further conveying mechanism 80 is provided to advance the containers from the unloading platform 70 onto a further stretch 82 of conveyor.

Prior to entrance into the treatment chamber 40, means is provided to apply a cover 90 to each container, conveniently at the point where it emerges from the tunnel 16. A typical cover is shown in Figures 2, 3 and 4, comprising side walls 92, 92 and a top 94. At the lower ends of the side walls 92 conveniently a cam formation 95 is provided, enabling the cover to be placed on the container C as it emerges from the tunnel 16, by downward movement, engagement by the formations 94 with the container springing the side walls 92 apart (Figure 3), the walls returning to their rest positions as the cam formations pass into engagement with chamfered edges 96 of the container.

Alternatively, particularly where the containers C are fed towards the loading platform 50 in spaced relationship, the cover 90 may be positioned in the path of advancement of the container, so that the conveyor enters into the cover through an open end thereof, the opposite end conveniently being closed so that further movement of the container carries the cover with it onto the loading platform 50.

Similarly means is provided downstream of the unloading platform 70 to remove the covers from the containers, and to return the covers along path P for reuse.

Preferably the covers are provided with small apertures, whereby to permit flow of treatment gases into the interior of the container, but of insufficient size to allow any significant turbulence to be caused by wing flapping within the container.

Whilst in the preferred embodiment a cover is shown for each individual container, if desired a single cover may embrace a plurality of containers, such as the number handled simultaneously by the lowering and lifting mechanisms.

Advantageously the sizes of the containers, in relation to the number simultaneously fed into the chamber 40, and in relation to the size of the shafts 42 and 44, and the size of the chamber 40, and the speed with which the containers are fed through the treatment chamber, is such as to minimise pumping action as may tend to cause gases to be displaced from the chamber to the outlet shaft in particular. In this manner it has been found that, by ensuring (for example) that the treatment gases reach a level of half-way up the shafts 42 and 44, a high accuracy of the content of treatment gases within the chamber 40 may be maintained, ensuring a high degree of effectiveness of treatment, together with only minimal loss of treatment gases.

Preferably the cross-sectional areas of the containers is no more than 75% of the cross-sectional area of the shafts, preferably 65% or less.

It is also to be appreciated that whilst the invention has been described utilising conveyor means afforded by passive stretches of conveyor and rams, active conveyors may be used where this is desired.

Figure 5 is a schematic view of the treatment plant, showing alternative arrangements of inlet and outlet into the access shafts 42 and 44. As is shown in Figure 5, gas flows through the chamber 40 in a direction opposite to that in which the containers C are moved through the chamber, from an inlet 90 to an outlet 92. Conveniently sensors 94 are located at spaced positions along the chamber, to verify that the level of oxygen in the gas within the chamber contains a sufficiently low oxygen level.

If desired, the height of the chamber increases slightly in the direction from the outlet shaft 44 to the inlet shaft 42, as shown in Figure 5.

Preferably the conveyor 41 is located a short distance above an apertured floor 96, allowing for convenient cleaning of the interior of the chamber 40, a drain 98 being provided if desired.

As is shown in Figure 5, the inlet 46a and the outlet 48a extend in the vertical plane, rather than in the horizontal plane as shown in Figure 1.

The treatment plant which is the first alternative embodiment of this invention, illustrated in Figure 6 comprises a treatment tank 106 in which a controlled, enclosed environment may be maintained, an inlet 108 and an outlet 110 opening into a roof 112 of the chamber 106.

Mounted within the treatment chamber 106 is a carousel 114, comprising a plurality of hanging platforms 116 suspended from a periphery of the carousel, each platform 116 being capable of supporting and conveying in a generally horizontal disposition a container or crate 118 containing poultry. Drive means (not shown) for the carousel is operative to rotate the carousel in a stepwise manner so as to bring each platform 116 in turn alongside a loading station 120, at which a crate 118 conveyed to the loading station 120 by a conveyor 122 may be moved from the conveyor 122 onto a platform 126 by a loading ram 124.

Adjacent to the outlet 110 is an unloading station 126, at which an unloading ram 128 is provided to move a container 118 from a platform 116 at the unloading station onto a conveyor 130, by which the container may be conveyed from the vicinity of the treatment plant.

Means 132 is provided to maintain in the chamber 106 a treatment gas which is heavier than air, the treatment gas comprising a mixture of carbon dioxide and nitrogen, although argon may be utilised in part at least to replace the nitrogen.

The treatment gas, being heavier than air, falls to the lower part of the tank, although desirably to reduce loss of treatment gas a small upper volume of

the treatment chamber contains air, the boundary between the air and the treatment gas being indicated by an interface 134 shown in Figure 6.

In the use of the treatment plant which is the first alternative embodiment of the invention, a desirable treatment gas which is anoxic and/or anaesthetic is maintained in the chamber 106, and the carousel 114 is rotated in a stepwise manner. At each stage between its rotational steps a container 118 containing live poultry is loaded by the ram 124 onto a platform 116, and on continued rotation of the carousel the container is immersed into the treatment gas. The specific number of platforms 116 provided on the carousel, together with the speed of rotation, is such that, by the time the containers emerge from the outlet 110, the poultry in the container has been stunned or killed, as is desired.

As the container emerges from the outlet 110, the unloading ram 128 is operated to transfer the container from the platform 116 onto the conveyor 130, by which the poultry is conveyed to subsequent treatment operations, which may include de-feathering and evisceration.

If desired the carousel may be rotated on a continuous basis, automatic means being operative to ensure that a platform 116 picks up the container 118 as it passes the loading station 120, and deposits its container as it passes the unloading station 126.

The treatment plant which is the second alternative embodiment of the invention (shown in Figure 2) utilises a treatment gas which is lighter than air, and the treatment plant 140 thus has an inlet 142 and outlet 144 provided in the lower part of the chamber. Mounted in the upper part of the chamber is a conveyor 146, a lifting ram 148 being provided to lift containers in sequential order from a loading conveyor 150 upwardly into the treatment chamber 140, a transfer ram 152 being provided to transfer each container in turn from the lifting ram 148 onto the conveyor 146.

Operative through the outlet 144 is an unloading ram onto which the containers are moved in turn from the conveyor 146, a transfer ram 156 being

provided to transfer containers from the unloading ram when in its lower position to a further conveyor 158.

Means 160 is provided to maintain a controlled environment within the upper part of the chamber 140, said means being operative to provide in said upper part an atmosphere consisting of lighter than air gases, such as helium, and including sensors (not shown) within the chamber 140. Being devoid of oxygen, poultry passing through the treatment chamber on the conveyor 146 are humanely killed, the speed of operation of the various conveyors, together with the length of the chamber 140 being selected to ensure that the poultry is retained in the treatment atmosphere for the desired period of time.

If desired the controlled atmosphere may include an anaesthetic gas, to stun the poultry prior to killing.

If desired, the carousel 114 of the first alternative embodiment may be used in conjunction with the chamber 140 of the second alternative embodiment.

The third alternative embodiment illustrated in Figure 8 utilises as treatment gas a gas which has a density similar to that of air, but from which oxygen has been removed, and/or to which carbon dioxide has been added. Thus the treatment plant which is the third embodiment of the invention comprises a treatment chamber 170 through which crates 172 containing poultry are fed by a conveyor 174, an intermediate conveyor 176 being utilised to transfer the crates 172 from a delivery conveyor 178 through an inlet zone 180 onto the conveyor 174, and an intermediate conveyor 182 being utilised to feed crates from the conveyor 174 through an outlet zone 184 onto a removal conveyor 186. In this manner escape of gases constituting the controlled environment of the treatment tank 170 may be reduced. Conveniently however an inlet means 188 is provided by which gases to maintain the controlled environment are fed from a control means 189 into the outlet zone 184, gas flowing backwardly through the treatment chamber 170 and exiting from the inlet zone 180, reducing tendency for air to be entrained into the treatment chamber 170 as crates 172 are passed into the treatment plant. Similarly as with the previous embodiments the control means

189 comprises sensors (not shown) operative to determine the constitutency of the gases within the chamber 170.

The gases which constitute the controlled environment of the third embodiment is conveniently air from which oxygen has been removed by the use of burning methane therein, together with the use of oxyphilic substances to absorb residual oxygen, care being taken to ensure the absence of carbon monoxide, and to remove excess heat from the gas prior to admission to the chamber 170.

Similarly, the length of the chamber 170, together with the speed of operation of the various conveyors, is such as to ensure subjection of the poultry to the effects of the treatment gas for an adequate period of time.

The treatment plant which is the fourth alternative embodiment of this invention comprises an elongate, open-topped tank 200 divided by vertical walls into a plurality of treatment zones 202a, 202b, 202c, etc. In each treatment zone a vertical platform 204 is provided, which may be lifted by a ram 206 from a position adjacent to the open top of the treatment zone to a lowermost position, as shown in Figure 9.

Running alongside the treatment chamber is a delivery conveyor 208, loading rams 210a, 210b, 210c, etc. being provided adjacent to each of the treatment zones, opposite to unloading rams 212a, 212b, 212c, etc.

In the use of the fourth embodiment in the execution of this invention, crates 214 containing live poultry are conveyed to towards the treatment plant by the conveyor 208.

With the ram 206 in its elevated position, a loading ram 210 will advance a crate 214 onto the platform 204, subsequent to which the ram 206 will retract, lowering the crate into the treatment chamber.

On immersion of the poultry in the controlled environment for a desired period of time, the crate is elevated by the ram 206, and the unloading ram 212 is utilised to move the crate from the platform 204 onto an unloading conveyor 218 conveniently disposed above the conveyor 208.

In the fourth alternative embodiment, the inlet opening into the chamber is provided by the same formation which provides the outlet through which poults are conveyed from the chamber. Additionally whereas the treatment chamber 200 is shown open-topped, and the environment, under control of control means (not shown) is heavier than air, such as a mixture of nitrogen and carbon dioxide, it will be appreciated however that the fourth embodiment may be utilised with a lighter than air treatment gas, simply by inverting the treatment chamber 200, and arranging that the loading rams 206 move the containers into the controlled environment by upward movement through an open bottom.

The embodiment shown in Figure 10 illustrates the application of this invention to a treatment plant suitable for use in treating the poultry whilst it is being conveyed from (e.g.) a farm to a poultry treatment plant. Thus Figure 10 illustrates schematically a lorry into a body 218 of which crates 220 are capable of being stacked (such as by a fork lift truck) in a conventional manner. When the opening of the body 218 (such as the tail gate 222) is closed, the body is substantially airtight.

Means (not shown) is provided to pump into the interior of the body 218 a treatment gas, conveniently comprising a mixture of nitrogen and carbon dioxide, to purge oxygen-containing gases from the body conveniently through an outlet 224 located at a upper part of the body. Desirably control means (not shown) is provided adjacent to the outlet 224 to detect the emission of significant proportions of carbon dioxide in the vented gases, to terminate or reduce the operation of the inlet means. Desirably however a slow continuous feed is maintained, to ensure that the desired treatment atmosphere is maintained within the body 218.

It will of course be appreciated that the embodiment illustrated in Figure 10 may be utilised with lighter than air gases, conveniently the vent outlet 224 in such circumstances being placed at a lower part of the body 218, or with an oxygen-depleted atmosphere the gas initially contained with the body 218 being moved simply by purging.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

1. A treatment plant comprising a chamber, means for maintaining a controlled environment within the chamber, an inlet through which a container may be moved, means to move the container through the inlet into the chamber, means for moving the container through the chamber, and means to move the container from the chamber.

2. A treatment plant according to Claim 1 wherein the same mechanism is used both to move the container through the inlet into the chamber, and to move the container through the chamber.

3. A treatment plant according to one of Claims 1 and 2 wherein the same mechanism is utilised both to move the container through the chamber and to move the container from the chamber.

4. A treatment plant according to any one of the preceding claims comprising a carousel mechanism, onto which containers are placed, and by which containers are moved through the inlet into the chamber, through the chamber and through an outlet from the chamber.

5. A treatment plant according to Claim 1 wherein separate mechanisms are utilised to move the container through the inlet into the chamber, and to move the container through the chamber.

6. A treatment plant according to one of Claims 1 and 5 wherein a further separate mechanism is utilised to move the container through an outlet from the chamber.

7. A treatment plant according to one of Claims 4 and 6 wherein the inlet and outlet are provided at the same location in respect of the chamber.

8. A treatment plant according to any one of the preceding claims comprising delivery mechanism to deliver containers to the vicinity of the inlet, and to carry containers from the vicinity of the outlet.

9. A treatment plant according to Claim 8 comprising conveying means to convey containers from the inlet into the treatment chamber in a heightwise direction, and from the chamber to the outlet in a heightwise direction.

10. A treatment plant according to Claim 8 comprising means for maintaining a controlled atmosphere in the chamber comprising a gas or a mixture of gases having a density less than that of air, said conveying means being operative to convey the containers from the inlet upwardly into the controlled environment.

11. A treatment plant according to Claim 8 comprising means for maintaining a controlled atmosphere in the chamber comprising a gas or a mixture of gases having a density greater than that of air, said conveying means being operative to convey the containers from the inlet downwardly into the controlled environment.

12. A treatment plant according to Claim 10 comprising an inlet shaft extending downwardly from the inlet into the chamber and an outlet shaft extending upwardly from the chamber to the outlet, the chamber and said shafts being sealed against escape of treatment gases below the inlet and outlet openings.

13. A treatment plant according to Claim 11 comprising an inlet shaft extending upwardly from the inlet to the chamber and an outlet shaft extending downwardly from the chamber to the outlet, the chamber and said shafts being sealed against escape of treatment gases above the inlet and outlet openings.

14. A plant according to any one of the preceding claims comprising loading mechanism for moving a container from a loading station adjacent to the inlet opening to a position in which said container may be engaged with first vertically movable means and the plant comprises unloading mechanism for moving a container from engagement with second vertically movable means to an unloading station adjacent to the outlet opening.

15. A treatment plant according to Claim 14 wherein the lifting and lowering means, together with the loading and unloading mechanisms, are each adapted to move a plurality of containers at a time.

16. A treatment plant comprising a chamber, means for maintaining within the chamber a control environment comprising a gas or mixture or gases having an anoxic or anaesthetising effect (hereinafter referred to as a treatment gas) on poultry, and having a density different from that of air, means for maintaining an interface between said treatment gas and air, means for conveying poultry through the interface into the treatment gas, and means to convey the poultry from the treatment gas subsequent to the treatment gas having had the desired effect.

17. A treatment plant according to Claim 16 wherein subsequent to the step of conveying the poultry through the interface into the treatment gas and prior to the conveying of the poultry from the treatment gas, the intermediate step is carried out of conveying the poultry through the treatment gas, whereby the poultry is retained in the treatment gas for a desired period of time.

18. A treatment plant according to one of Claims 16 and 17 wherein the treatment gas comprises a mixture of predominantly an inert gas and carbon dioxide.

19. A treatment plant according to Claim 18 comprising a well within which the treatment gas is maintained by virtue of its high density, the poultry being conveyed into the well for the treatment gas to have the required effect, prior to lifting of the poultry from the well for further processing.

20. A treatment plant according to one of Claims 16 and 17 wherein the treatment gas comprises light but inert gas such as helium or neon, the treatment plant comprising an upper chamber in which the treatment gas is maintained by virtue of its lower density, the conveyor means being operative to convey the poultry upwardly through the interface and into the treatment gas, and subsequently downwardly from the treatment gas through the interface.

21. A treatment plant according to one of Claims 16, 17, 18, 19 and 20 wherein the treatment gas comprises a gas or mixture of gases from which oxygen has been removed.

22. A treatment plant according to any one of the preceding claims wherein the poultry is conveyed through the chamber in containers, the containers conveniently holding a plurality of poults, the containers being conveyed through the chamber serially or in batches.

23. A treatment plant according to Claim 22 comprising means for the automatic removal of the containers from a module or framework, and for conveying the containers serially or in groups to the loading station.

24. A treatment plant according to Claim 23 wherein said conveyor mechanism is tunnelled.

25. A treatment plant according to one of Claims 23 and 24 wherein additional means is provided for applying a cover to the containers prior to entry thereof into the treatment chamber.

26. A treatment plant according to any one of Claims 22 to 25 wherein the covers are open-bottomed and may be snap-fitted onto the container during its travel through the treatment plant.

27. A treatment plant according to any one of Claims 22 to 25 wherein the covers are open at one end, facilitating the location of the cover over the container by lateral relative movement therebetween.

28. A treatment plant according to any one of Claims 25 to 27 comprising means to align the cover with the tunnel so that the container enters the cover on movement from the tunnel towards the treatment plant.

29. A treatment plant according to any one of Claims 25 to 28 comprising disengagement means to separate the cover and the container.

30. A treatment plant according to any one of Claims 25 to 29 comprising transfer means to return such separated covers to a location at which they may be reapplied to incoming containers.

31. A treatment plant according to any one of Claims 25 to 30 wherein each cover is suitable in size for an application to a single container.

32. A treatment plant according to any one of Claims 25 to 31 comprising an observation station, prior to the cover-applying station, to enable visual inspection of the poultry in the containers to be carried out prior to their entry into the treatment chamber.

33. A method of the humane killing of poultry, involving subjection of the poultry to a gas having a high carbon dioxide content, wherein the poultry is conveyed to the plant in containers, and wherein a temporary cover is provided to the containers prior to movement of the containers into the treatment chamber for subjection of the poultry to the treatment gas.

34. The invention according to any one of the preceding claims wherein the containers are moulded from plastics material, being open-topped.

35. The invention according to one of Claims 33 and 34 wherein means is provided to prevent the inadvertent removal of the cover from the container during its passage through the treatment plant.

36. The invention according to Claim 35 wherein interlocking formations are provided which are engagable by relative movement between the cover and the container in one direction.

37. The invention according to Claim 36 wherein the cover is moulded from plastics material and is applied to the container by relative movement therebetween in the heightwise direction of the container.

38. The invention according to Claim 34 wherein the construction and arrangement is such that the container may be entered into the cover by relative longitudinal movement therebetween.

39. The invention according to Claim 38 wherein the cover has at least one open end wall, and one close end.

40. The invention according to any one of Claim 33 to 39 wherein the cover is provided with small apertures.

41. A treatment plant comprising a chamber, means for maintaining a controlled environment within the chamber including maintaining within the chamber a gas or a mixture of gases predominantly devoid of oxygen, and maintaining the poultry within the treatment chamber for a sufficient period of time for the poultry to be stunned or killed.

42. The invention according to Claim 41 wherein in addition to being devoid of oxygen, the treatment gas comprises one or more anaesthetising gases.

43. The invention according to Claim 41 wherein the poultry is conveyed into the chamber through an inlet and from the chamber through an outlet in a continuous process, means being provided to supply treatment gas to the treatment chamber to maintain the desired environment within the treatment chamber.

44. The invention according to Claim 43 wherein such means is in the form of an inlet located adjacent to the outlet chamber, by which gas is piped into the treatment chamber, to flow outwardly through the inlet chamber in a purging operation.

45. The invention according to Claim 41 wherein poultry in crates is loaded into a treatment chamber, and subsequent to completion of loading the chamber is closed, and purged with treatment gas.

46. The invention according to Claim 45 wherein the treatment gas is heavier than air, the chamber being purged from the bottom.

47. The invention according to Claim 45 wherein the treatment gas is lighter than air, the chamber being purged from the top.

48. The invention according to Claim 45 in which the container is a transportation device involved in the transportation of poultry from a farm area to a processing plant.

49. A method of transportation of poultry, involving the use of a treatment plant of the kind set out in Claim 45, and utilising said treatment plant to humanly stun or kill the poultry during such transportation.

50. A treatment plant substantially as hereinbefore described with reference to any of the accompanying drawings.

51. A method of humanly stunning or killing poultry, when carried out substantially as hereinbefore described with reference to any of the accompanying drawings.

52. Any novel feature or novel combination of features hereinbefore described and/or shown in the accompanying drawings.

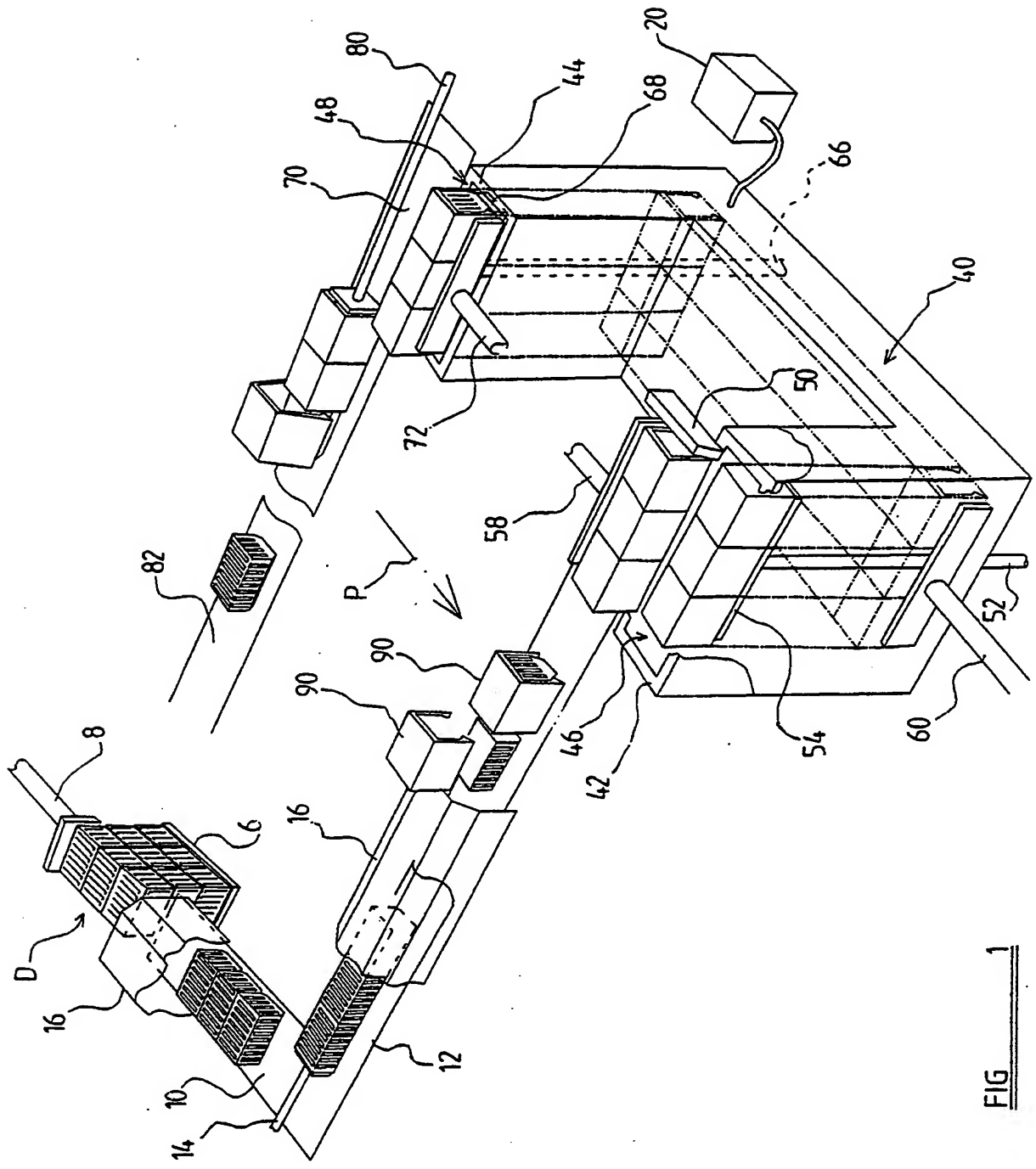
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FIG 1

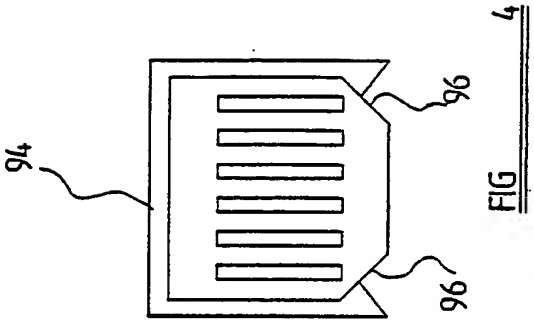


FIG 4

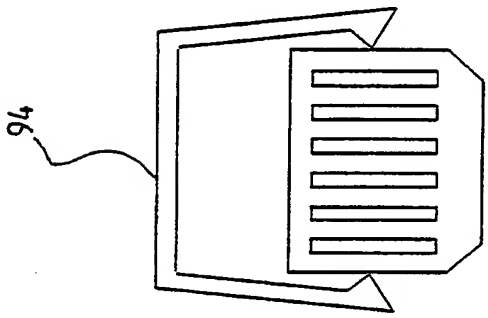


FIG 3

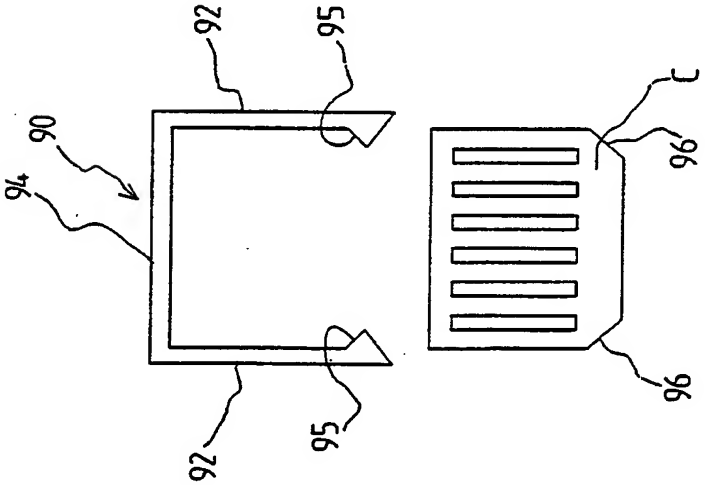


FIG 2

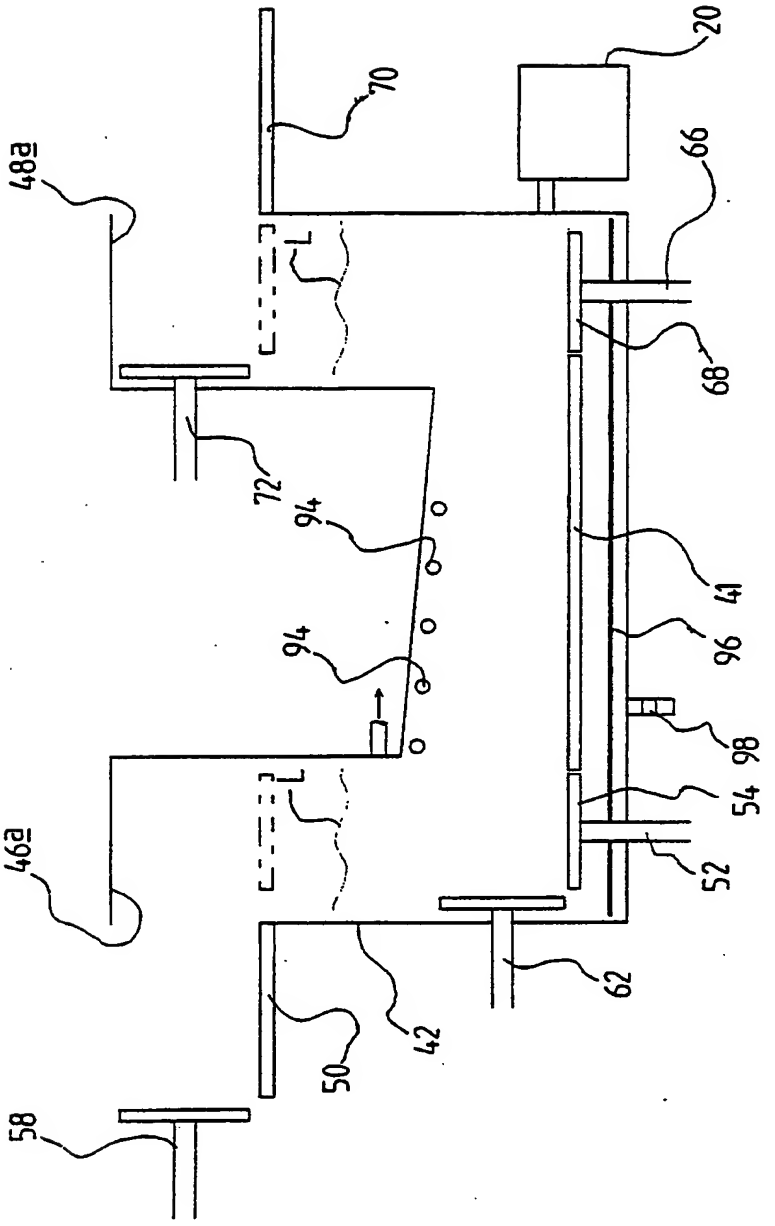


FIG 5

FIG 6

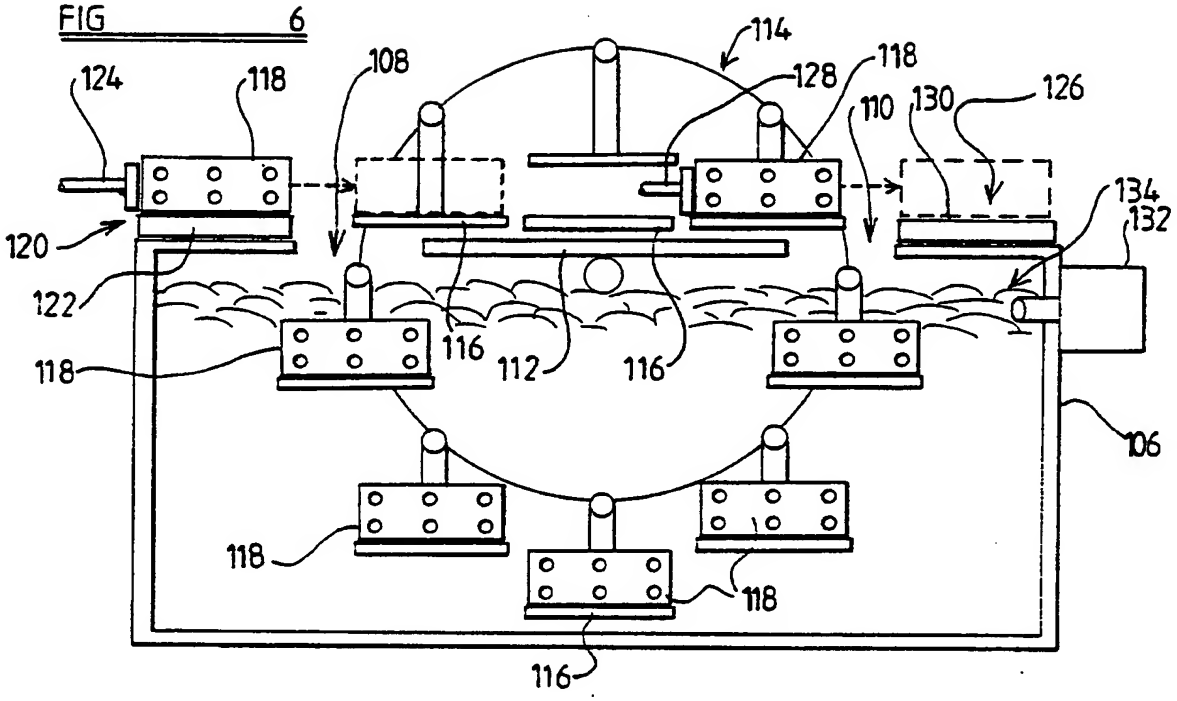


FIG 7

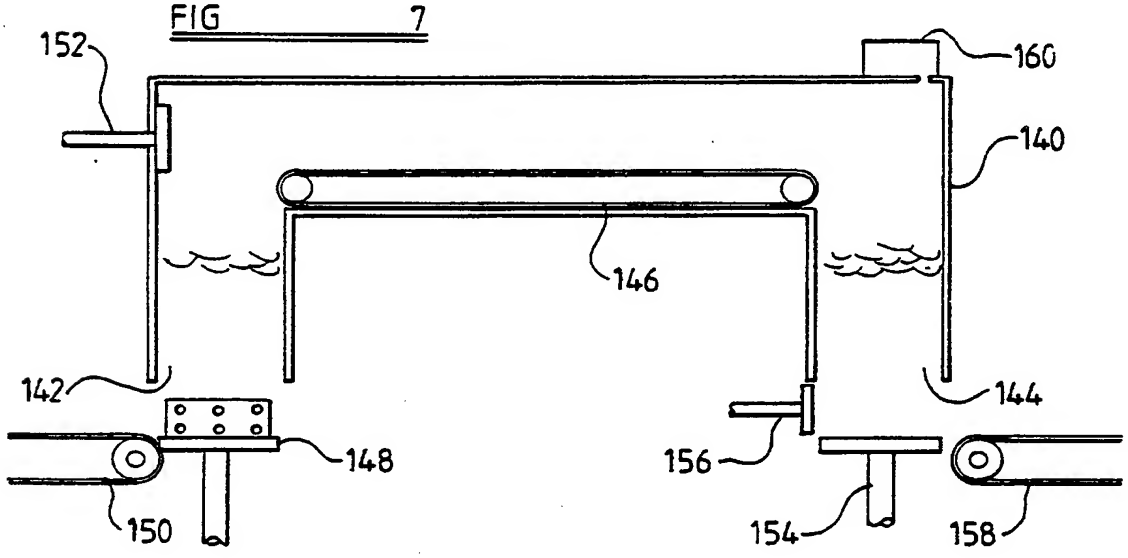
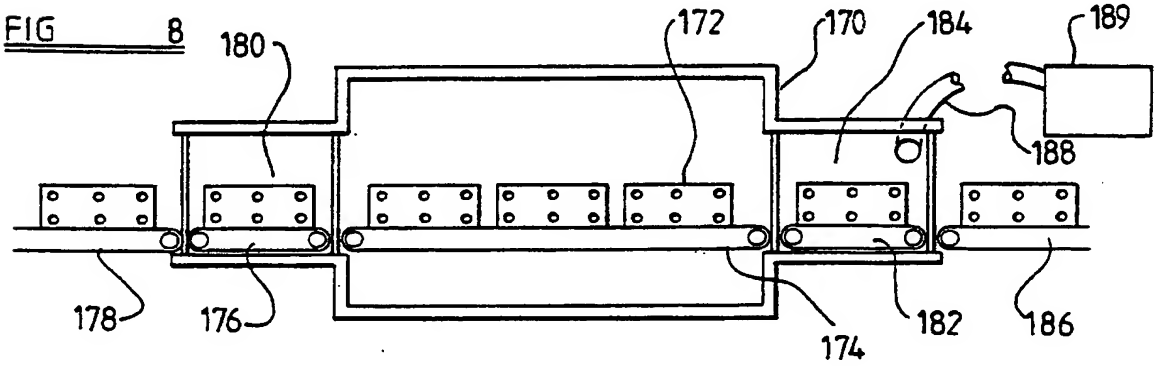


FIG 8



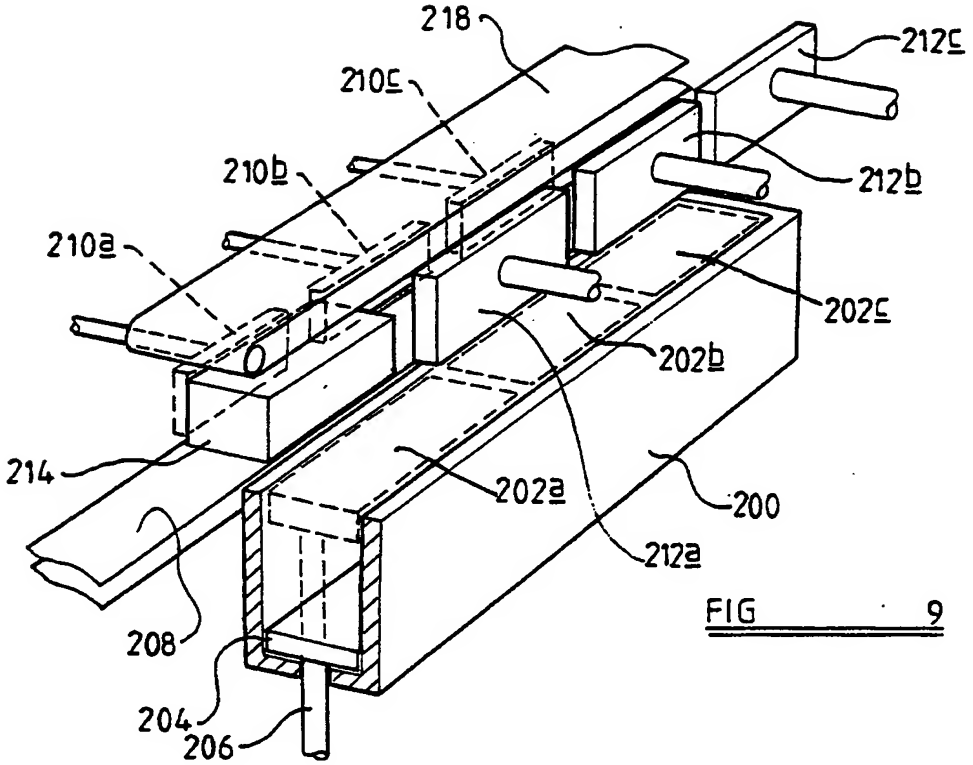

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FIG 9

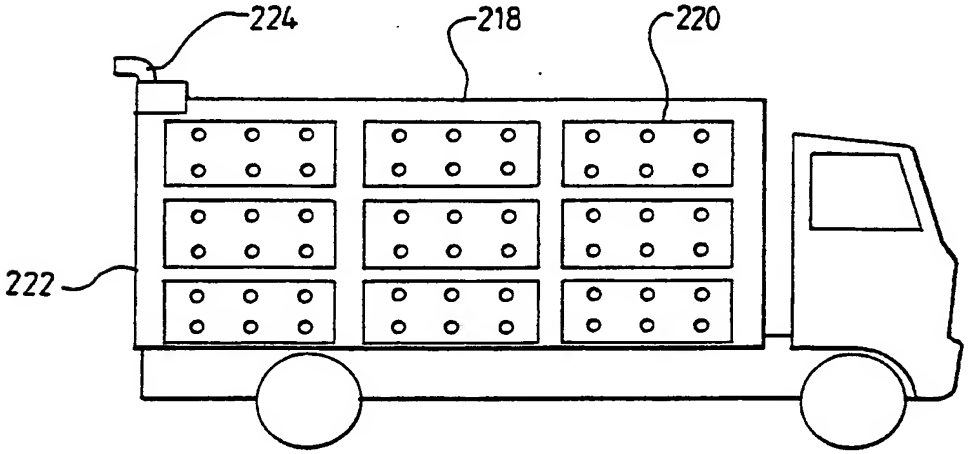
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FIG 10

INTERNATIONAL SEARCH REPORT

Intern. nal Application No
PCT/GB 94/01152

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 A01K3/00 A01K45/00 A22B3/00 A22B3/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 A01K A22B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 441 633 (SLAGTERIERNES FORSKNINGSINSTITUT) 14 August 1991 see the whole document	1,5,6,8, 11, 13-19, 22-24, 41-44, 50-52
X	GB,A,764 138 (WERNBERG) 19 December 1956 see the whole document	1-4,7
A	DE,A,37 24 067 (HAAS) 2 February 1989 see the whole document	45,49
A	EP,A,0 434 278 (THE BOC GROUP PLC) 26 June 1991 cited in the application	

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 July 1994	05.08.94

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	von Arx, V

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INTERNATIONAL SEARCH REPORT

Intern. ...nal Application No
PCT/GB 94/01152

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP,A,0 061 869 (ANGLIA AUTOFLOW LIMITED) 6 October 1982 cited in the application	

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/GB 94/01152

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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GB-A-764138		NONE		
DE-A-3724067	02-02-89	NONE		
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		AU-A-	6790490	27-06-91
		CN-A-	1052593	03-07-91
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